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UNCLASSIFIED - INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION -1960

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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM-- SOVIET-BLOC ACTIVITIES

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I. GENERAL

Soviet Scientist Awarded Gold Medal

The Royal Astronomical Society of England announced on 12 January, the award of a gold medal to V.A. Ambartsumyan, President of the Academy of Sciences Armenian SSR and director of the Byurakan Astrophysical Observatory, for his work in the fields of theoretical and stellar astronomy. ("Gold Medal to Soviet Scientist"; Moscow, Izvestiya, 13 Jan 60, p 5)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Kukarkin Interviewed on Prospects of Space Research in View of Current Pacific Tests

Prof Boris Kukarkin, vice-president of Astrosovet (Astronomical Council of the Academy of Sciences USSR) and vice-president of the International Astronomical Society, granted an interview to Giusseppe Garritano, L'Unita's (Rome) special correspondent to Moscow. The interview took place in Professor Kukarkin's room at the State Astronomical Institute imeni Shtern'berg. Garritano drew the conclusion from the interview that the current Soviet experiments will pave the way for the creation of future lunar scientific observatories and observation-satellites.

In commenting on the significance of the present Pacific rocket tests and what they will mean to astronomy, Kukarkin said that he could not give much information on the tests. The tests do indicate, he said, that in a short time, man will make another great forward step in the study of the cosmos. Science has entered into the cosmic era; the study of physical, geophysical, astronomical, and biological problems, whose solutions are expected to be attained by an absolutely new means -- satellites and space rockets -- is developing on a wide front.

As regards the science of astronomy, with which he is specifically concerned, Kukarkin says that he loves to repeat what he has previously said: that on 4 October 1957, astronomy was transformed from a purely observational science into an experimental science. Today, it can be further stated, he adds, that soon, because of rapid technical development, an astronomer not only will observe, but also will actively intervene in natural processes. Rockets and satellites will make it possible for us to study the physical phenomena of cosmic space, beyond the Earth's atmosphere, so to speak, in its pure state. Within a relatively short time, with the aid of more powerful rockets, permanent automatic stations will be established on the Moon's surface and in very heavy

satellites launched in almost permanent orbits at great distances from the Earth. These also, says Kukarkin, will act as automatic scientific stations, carrying out programmed studies and transmitting the resultant data back to Earth.

As regards physical phenomena beyond the atmosphere, particularly cosmic radiation, Kukarkin says that here we deal with physical phenomena connected with the release of energy in nuclear reactions, some of which are known to physicists, while others are still unknown despite their certain presence in space. The study and subsequent "reproduction" of these still unknown processes will open new possibilities to atomic physics and in the use of nuclear energy. The phenomena of the sudden release of energy are observed in some stars (the supernovae) and in many variable stars. Kukarkin is convinced that these phenomena will be explained when the radiation emitted by these stars can be directly studied. This can be done through the creation of lunar observatories or heavy satellites, he believes.

The systems employed for these studies can be varied, continues Professor Kukarkin. Up to a certain point, automatic installations will be successfully landed on the Moon by soft landings. Automatic core drills will be used for studying the underlying strata of the lunar surface, and the information will be transmitted to Earth. Thus, says Kukarkin, a new science, "selenology," will arise. The same method can be used in studying Mars and Venus. The comparative study of the "ground" of the various planets, Kukarkin feels, can serve, not only for explaining in an exact way the history of the Earth and the planets, but also for looking into their future, particularly the future of our planet.

In answer to a question as to what knowledge we have acquired about the Moon and the planets by means of the cosmic rockets launched to date, Kukarkin said that one of the most interesting discoveries for astronomers was the proof of the absence of a lunar magnetic field. This is of great importance in the study of the origin of the magnetic field of the Earth, which is one of the more important geophysical phenomena from the viewpoint of its practical consequences (particularly in the field of communications).

There is much discussion on the nature of the Earth's magnetic field among scientists. Some attribute its origin to the internal structure of the Earth, its nucleus; others seek its origin in external causes, for example, in the radiations present in the ionosphere. Now, with the first two Luniks, the existence of a sort of ionosphere, but not of a magnetic field, was discovered on the Moon, which seems to support those claiming the "Internal" origin of terrestrial magnetism.

In commenting on the possibility of finding other forms of life on the planets which evolved under different conditions than those which exist on Earth by means of rockets, Professor Kukarkin had this to say: We know only one form of life, and that is tied to the conditions of our planet. But this question of life on other planets will be finally solved in our time by experimental means, that is, by landing instruments on the planets and then by the landing there of Man himself. Life has its origin in elementary forms. If this appeared elsewhere in the form of elementary organic units in conditions different from terrestrial conditions, these organic combinations, in the course of millions or billions of years, have adapted themselves to those conditions in such a way as to give rise to forms of life completely different from those on Earth. Thus, if on Mars, for example, life made its appearance in its most simple form billions of years ago, it is not denied that it evolved there in a form capable of existing in conditions which are absolutely insupportable for a terrestrial organism which arrives there without the necessary protection. If life on Mars, continued Prof Kukarkin, developed until the formation of thinking beings who then reached the level of scientific knowledge, these beings could very well hold that life does not exist on Earth since the Earth's atmospheric pressure is so much greater than that on Mars. Therefore, concludes Prof Kukarkin, we are perhaps close to a decisive turn as regards our conceptions on life, on its origin, and on its development. ("Observatories Will Be Created on the Moon or on Artificial Satellites," by Giusseppe Garritano; Rome, L'Unita, 16 Jan 60, p 8)

New Hungarian Astronautics Department Formed

A central astronautics department has been formed within METESZ (Federation of Technical and Natural Science Associations). Dr Albert Fono, Corresponding Member of the Hungarian Academy of Sciences and internationally famous pioneer in jet propulsion, was elected president. Hungarian experts will participate in the 1960 meeting of the International Astronautics Federation, which is to be held in Stockholm. ("Astronautics Department Formed"; Budapest, Magyar Nemzet, 12 Dec 59, p 6)

III. UPPER ATMOSPHERE

Pulkovo Astronomers Find Error in World Time

Pulkovo astronomers have determined a correction for world time.

Usually determined according to the rotation of the Earth around its own axis, world time acquires errors arising because of irregularities in this rotation. This has been established by means of studying observations of the Moon's orbital motion.

Associates of the ephermerides time service at the Pulkovo Observatory, using a lunar camera (it permits determinations of the Moon's position by the photographic method), successfully obtained about 300 photographic plates with the picture of the Moon and the surrounding stars. Almost 100 pictures have already been measured. Using the obtained data, the astronomers made calculations and established that it is necessary to add 31 seconds. This difference has accumulated since the first decade of this century.

Similar data on this correction will be published in the next issue of Astronomicheskiy Tsirkulyar, which is published by the Astronomical Council of the Academy of Sciences USSR. Thus, from 1960 on, scientists--radiophysicists, cosmologists, and other researchers--of different countries can use the corrected time for scientific work connected with the study of the movement of celestial bodies and the determination of the orbits of artificial cosmic bodies. ("World Time More Accurately Determined at Pulkovo"; Moscow, Izvestiya, 31 Dec 59, p 4)

Pulkovo Radiotelescope Gets Details of Radio Source Sagittarius-A

In April 1959, the large radiotelescope of the Main Astronomical Observatory of the Academy of Sciences USSR, Pulkovo, was used for observations of a radio source on wave lengths of 3.2 and 9.4 centimeters. The radiotelescope pattern, with half-power points, was 1.1 minute by 40 minutes at 3.2 centimeters and 3.7 minutes by 120 minutes at 9.4 centimeters. Radiometers conforming to these wave lengths are described by G. P. Apushkinskiy (Radiotekhn. i elektronika, Vol 3, No 6, 1958) and N.A. Bol'shakov and Yu. N. Pariyskiy (Izv. GAO (1959) [at press]. Four curves were recorded for the passage of the radio source across the antenna pattern on 3.2 centimeters and nine curves on 9.4 centimeters. An illustration shows the mean curve of the passage, as well as the curve of the passage on 33.3 centimeters, obtained by V.G. Mol'chan (DAN, Vol 129, No 5, 1959). The author notes that the complex structure of the radio source is evident from the illustration; the high resolution of the radiotelescope afforded the possibility of showing a

new bright detail of small angular dimension (Detail No. 1), a more expanded region around 0.5 degree (Detail No 3), and a very expansive source of radio emanation received on wave lengths of 9.4 centimeters and over (Detail No 2).

A second illustration shows the location of Detail No 1 in relation to a group of hot stars and gas nebulae observed by Hiltner (Astrophys.J., 120, 41, 1954) and Sharpless (Astrophys. J., 118,363, 1953). The right ascension of these details amounts to 17 hours 43 minutes 08.8 seconds (plus-minus 0.3 seconds) for epoch 1958.0, which differs only by 15 seconds from the coordinates of the center of the galaxy accepted at Moscow by the International Astronomical Conference of 1958. The radiation current from Detail No 1 amounts to about 15×10^{-25} watts per meters squared-cycles per second on both centimeter wave lengths, which indicates a thermal mechanism of the radioemanation. At the observed angular dimensions of the detail (3 minutes), this corresponds to emanation of an ionized gas with an emission of 10^6 at an emission temperature of 10,000 degrees Kelvin.

No gas nebulae have been observed in present-day surveys of the region of the sky corresponding to the position of Detail No 1; a powerful absorption of light in this region makes the area invisible in the optical range. If it is assumed that the minimum observed emission value in a survey amounts to 100, then the general absorption of light from the detail accounts for more than 8.5 minutes. The distribution of absorbed material in this region was recently investigated by J. Dufay (C.R., 248, No 5, 647, 1959), whereby it was shon that the absorption in the darkest part of an interstellar cloud in the center of the galaxy amounts to 9 minutes; thus the distance to the detail is greater than 7,000 parsec. If this distance is greater than 7,000 parsec, and, in the observed flow of the radio emission, the electron density in the detail amounts to more than 500 cm^{-3}, then the mass is approximately 10^4 $M_\odot$ for linear dimensions greater than 6 parsec. This is the most dense gas cloud in the galaxy and is also of enormous dimensions. The uniqueness of the cloud justifies the assumption that the discovered formation actually is the gas core of our galaxy.

The location of Detail No 3 is sharply asymmetrical in relation to Detail No 1; this is revealed most clearly on a wave length of 3.2 centimeters and less clearly on one of 9.4 centimeters and is completely imperceptible on one of 33.3 centimeters. Such an effect can be explained only on the basis of the complex spectrum of this detail: combinations of thermal emanation of an ionized gas with a distribution of brightness close to the curve of passage for 3.2 centimeters and nonthermal emanation strongly concentrated toward Detail No 1. The thermal portion of source No. 3 is

apparently associated with gas nebulae located in the inner arm of the galaxy, which is confirmed by the character of the asymmetry. On the other hand, the nonthermal component is very symmetrical in relation to Detail No 1, and this is particularly evident on a wave length of 33.3 centimeters, at which its emanation is dominant.

Detail No 2 is a continuation of the nonthermal component of Detail No 3. There is no doubt that the entire nonthermal component of the source is physically connected with Detail No 1. The thermal portion of Detail No 3 has an emission value of about 10^3 and becomes opaque at wave lengths over 100 centimeters. The effect of absorption was actually observed by Mills (Observatory, 76, 791, 1956) at a wave length of 3.5 meters with an antenna pattern of about 50 minutes. If only Detail No 1 were observed in the absorption, the effect of the absorption would be imperceptible because of the small angular dimensions.

As a result of the observations described here, the following model of the source is constructed in the direction of the center of the galaxy. The bright dense gas core of the galaxy with a dimension of about 6 parsec is immersed in a source of nonthermal radiation strongly concentrated toward the gas core. Both the core and its nonthermal cloud are seen through a group of gas nebulae located inside the inner arm of the galaxy at a distance of 3,000 parsec and often are concealed from us by the absorption of material.

Further observations will make possible a judgement of the accuracy of this model of this source. At the present time, at the Main Astronomical Observatory at Pulkovo, preparations are being made for an observation of this region with high resolution on the 21-centimeter wave length. A more careful investigation of the region in the optical range will also be necessary in order to reveal the gas nebulae in this direction and the source of diffusion of the absorbing material. ("A High-Resolution Observation of Radio Source Sagittarius-A," by Yu. N. Pariyskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 6, 1959, pp 1261-1263)

Planetarium Opens in Astrakhan'

A brief announcement was made by Pravda on the opening of a planetarium in Astrakhan'. The planetarium is in a special building located on the shores of the city's lake. Astrakhan' itself is located on the Volga River delta which enters the Caspian Sea. ("In a Few Words"; Moscow, Izvestiya, 7 Jan 60, p 4)

IV. SEISMOLOGY

Soviets Report Conformity Between Lower Boundaries of Earth's Crust and Mineral Deposits

A special geophysical expedition of the Kazakh Academy of Sciences has made a study of the Earth's crust at a depth of 60 kilometers. The study, made by the method of deep seismic sounding [GSZ], extended along a 1,000-kilometer line from Balkhash to Petropavlovsk.

Explosions for creating artificial earthquakes were set off in water reservoirs on the surface of the ground. The seismic waves reached the greatest depths of the Earth's crust and were detected by special apparatus on their return to the surface.

Study of the obtained data made it possible for the members of the expedition to construct a profile in depth of the Earth's crust. Upon analysis, a regularity between the determined forms of the deep boundaries of the Earth's crust and the deposits of valuable minerals was discovered. ("Depth--60 kilometers"; Moscow, Izvestiya, 13 Jan 60, p 4)

V. OCEANOGRAPHY

Mikhail Lomonosov Begins Seventh Research Voyage

The Mikhail Lomonosov, expeditionary ship of the Academy of Sciences USSR, left the port of Riga on 12 January on its next in a series of research voyages. This cruise, the seventh in the Atlantic Ocean, will last more than 3 months. Investigations will be conducted by more than 60 scientific and scientific-technical workers. A group of scientists from East Germany will also take part in the research work of the expedition. ("Latest News"; Moscow, Izvestiya, 13 Jan 60, p 1)

Expeditionary Ship, Voyeykov, Departs for Western Pacific

The expeditionary research ship, Voyeykov, of the Main Administration of the Hydrometeorological Service, USSR, has left on long scientific voyage, according to a dispatch from Vladivostok. The expedition will conduct investigations in the fields of meteorology, aerology, and

cceanography in the western part of the Pacific Ocean. The program of observations includes the study of the heat exchange of the ocean with the atmosphere, sea waves, and the hydrotechnical regime of ocean waters.

The scientific voyage will be made in the region between 150 and 170 E and 45 and 10 N and last about 2 months.

The results of the observations will be transmitted daily to the continent by radio. These data will be included in forecasts which are used by cargo ships plying the Pacific Ocean. ("On a Great Voyage"; Moscow, Pravda, 11 Jan 60, p 4)

Lomonosov to Study Atlantic Currents

The Mikhail Lomonosov, Soviet expeditionary ship, is reported to have left Riga on 12 January on a 3-month scientific voyage in the Atlantic Ocean. The investigations to be conducted will embrace the zones of two currents, the Antilles and the Gulf Stream. ("Brief Notes"; Moscow, Pravda, 13 Jan 60, p 6)

Shcherbakov Calls for Greater International Scientific Cooperation in Oceanographic Research

Academician D. I. Shcherbakov, Secretary of the Division of Geological-Geographical Sciences of the Academy of Sciences USSR, commented on the great expansion of work in the last century in the field of oceanography in the development of geographic research. He referred to this period as that of mastering the seas, in contrast to the preceeding century, when description of the continents was the principal work, and commented as follows.

The importance and necessity of expanding international cooperation in complex investigations of the oceans was emphasized at the recent oceanographic congress held in New York City. This is true of all of the basic divisions of oceanology: physics, chemistry, geology, and biology.

In the opinion of prominent representatives of world oceanography, our knowledge of the oceans will advance so quickly before long that it will benefit Man on a large scale. It is sufficient to say that at present such problems as the control of the climate by means of artificial precipitations, i.e., the controlled transfer of moisture by air currents, have arisen. It is possible to achieve this by action on the deep currents and on the ice cover of the northern and southern oceans. Finally, Man can extract from the bottom of the ocean various useful minerals. Grandiose and fully practicable prospects for mastering the ocean require

the wide participation of a great international union of scientists. This is recognized by the oceanologists of many countries, although various voices disrupt the general harmony, alluding to the necessity of creating some "partitions" in the oceans in order to know precisely "where whose harvest" is.

Soviet scientists, steadfastly, are carrying out a policy of friendship and cooperation with the scientists of all countries and consider that joint investigations of ocean life will bring enormous benefits to Man. Concerning this, the experience of Antarctica speaks for itself, and the results of the New York City conference and the mutual visits of research ships by American and Soviet colleagues are indicative of this.

In this connection, there is no doubt that the results of Soviet oceanographic research in Antarctic, permitting the acquisition of new data concerning the movements of antarctic waters, are of great interest. Of interest also are observations on the currents in the northern part of the Atlantic Ocean, where, even at a depth of more than 4 kilometers, balanced buoys indicated a speed of up to 2 centimeters per second, and a "zero surface," i.e., a supposed section of attenuation of currents, was not observed.

Microbiological research in the Indian Ocean and geographical work in the North Arctic Ocean contributed to an explanation of the over-all regimen of the movement of waters in the World Ocean. The scientists of various countries are moving forward in the solution of this and other problems of interest to all by means of original approaches and methods, and they experience a constant and urgent need to exchange the experiences achieved. In a number of cases, it is also necessary to simultaneously conduct investigations at great distances.

This cooperation can be applied to another most important problem of modern science on the oceans. This concerns the mastering of the bottom mineral resources, keeping in mind that the reserves of maganese, nickel, cobalt, and copper on the ocean bottom are practically inexhaustible.

Future joint investigations provided for by the International Geophysical Cooperation can, as it appears to us, develop into the five most important directions of oceanology. They are: the history of the ocean, its population, the depths of the ocean, its border zones, and the cycle of organic and inorganic matter. Such a broad arrangement of the problem indicates that oceanological research must be conducted, not only by the specialists of one section, but also by the representatives of many other scientific disciplines. This thought was expressed particularly by Prof R. Revell, president of the New York City congress,

when he said: "Now, more than at any other time, oceanography is the meeting place of all sciences, and the most interesting part begins when people of different specialities converse on the over-all problems, with regard to which the ideas and knowledge of biologists, geologists, chemists, physicists, mathematicians, and engineers must be united for obtaining results."

Soviet oceanology has always pursued this principle, and it is possible that, in these words of Revell, the influence of our science is reflected, especially since, up to several years ago, this idea was not in vogue among American oceanographers.

We are firmly convinced that the guarantee of new successes in the science of the ocean is the universal expansion of scientific contacts between the scientists of the USSR, the US, and other countries. ("Period of Mastering the Oceans," by Academician D. I. Shcherbakov; Bakinskiy Rabochiy, 10 Dec 59, p 1)

VI. GLACIOLOGY

Results of Study on Fedchenko Glacier's Influence on Air Temperatures

A meteorological detachment of the Pamir Expedition, Leningrad University, conducted operations on Fedchenko Glacier in the summer of 1957 for determining certain quantitative characteristics of the influence of that glacier on the temperature regime of the air, based on the thermal regimes of different regions of the glacier.

The results of the observations which were conducted can be summarized as follows. Fedchenko Glacier, particularly its firn zone, has a considerable effect on the temperature regime of the air. The effectiveness of this influence is in direct relationship to weather conditions. In clear weather, the difference in the temperature over Fedchenko Glacier and the surrounding territories reaches 10-12 degrees. Cloudiness diminishes differences in the temperature regime of Fedchenko's separate regions. The mean difference of temperature between the glacier and its environs during overcast weather is estimated at 3-4 degrees. On the average, the air temperature on Fedchenko Glacier is 7-8 degrees lower than the territory surrounding it.

The observed dependence of values of a difference in temperature on cloudiness can have a certain prognostic value. It is possible, in particular, to calculate the air temperature in the firn region of the Fedchenko Glacier according to the temperature and cloudiness at the Lednik Fedchenko Station.

The expedition was headed by Prof O. A. Drozdov. Members were P.P. Arunov and V.V. Bufal, students, and the author, M. Khess. ("On Certain Peculiarities of the Temperature Regime in the Region of the Fedchenko Glacier," by M. Khess; Leningrad, Vestnik Leningradskogo Universiteta, Seriya Geologii i Geografii, Vol 3, No 18, 1959, pp 103-113)

VII. ARCTIC AND ANTARCTIC

Antarctic Flight

According to a radio report from Antarctica, the Soviet diesel-electric ship Ob', after partially unloading at Lazarev station and rendering aid to the Japanese icebreaker Soyya, approached the edge of the fast ice about 5 miles from Mawson. Here, aviation gas was transferred from the ship by helicopter for the flights planned between Lazarev and Mirnyy. The Soviet polar workers were warmly greeted by the Australian scientists at Mawson station.

Lazarev-Mirnyy Flight

An 11-hour, 3,500-kilometer nonstop flight from Lazarev to Mirnyy was made on 11 January by A. Pimenov, chief of the aviation detachment, piloting an IL-14. The flight was made to transport Ye. Korotkevich, Chief of the Fifth Antarctic Expedition, to the Soviet south pole observatory. Since its delivery, 2 weeks ago, from the Soviet Union, the plane has already made two exploratory flights--one in the direction of King Baudouin station (Belgium) and the other to the Pole of Relative Inaccessability. ("Radiograms From Antarctica"; Moscow, Izvestiya, 12 Jan 60, p 4)

Book on Antarctica

The book Sovetskiye Expeditsii v Antartiky, 1955-1959 (Soviet Expeditions in Antarctica, 1955-1959) has been issued by the Committee for the Conduct of the International Geophysical Year. The author, A. Nudel'man, senior engineer of the Department of Science, Main Administration of the Northern Sea Route, is in his fifth year of conducting operational communications and coordination of the activities of sailors, polar flyers, and scientists working in Antarctica. This made it possible for him to give a unique encyclopedic treatment to the most important facts, events, dates, and statistical results of the investigations.

The book is considered to be valuable because of its richness in particularly factual material and its accuracy and detail. (Antarctica for All," by O. Stroganov; Izvestiya, 4 Jan 60, p 4)

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